UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,463	09/27/2004	Kazuyoshi Honda	10873.1171USWO	2211

53148 7590 12/24/2009

HAMRE, SCHUMANN, MUELLER & LARSON P.C.
P.O. BOX 2902-0902
MINNEAPOLIS, MN 55402

EXAMINER	
WIECZOREK, MICHAEL P	
ART UNIT	PAPER NUMBER
1792	
MAIL DATE	DELIVERY MODE
12/24/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/509,463	HONDA ET AL.	
	Examiner	Art Unit	
	Michael Wieczorek	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5 and 7-11* is/are pending in the application.

4a) Of the above claim(s) *10 and 11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5 and 7-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

Claims 5 and 7 through 11 are currently pending. Claims 10 and 11 have been previously withdrawn as being related to a non-elected invention.

Response to Arguments

1. Applicant's arguments filed November 18, 2009 have been fully considered but they are not persuasive.

2. Applicant argues that Higuchi is not compatible with that of DeLozanne because Higuchi teaches using thermionic beams (unaccelerated electrons) while DeLozanne teaches using accelerated electron beams. This argument is not persuasive because nowhere in the references is there a teaching of accelerated or unaccelerated electrons being used. Furthermore, applicants previously presented reference of Britannica Online Encyclopedia defining thermal ionization (filed July 16, 2009) did not clearly disclose that thermionic electron beams are unaccelerated only that a lower voltage was used. Furthermore, newly submitted Wikipedia reference does discloses that generated electron beams are accelerated but the sentences before the highlighted sentence states "Electron beams can be generated by thermionic emission..." (Page 1 first paragraph of "Thin film deposition process" section). Based on the disclosure of the Wikipedia reference it would seem that the electron beams emitted from the thermionic beam generators of Higuchi are accelerated. Furthermore, Higuchi teaches that the thermionic beams generated are radiated toward the metallic vapor streams (Column 3 Lines 37-45). Since the electron beams of Higuchi are being radiated from the source toward the vapor streams they would have to be

accelerated toward the vapor streams thus making the electron beam sources of Higuchi accelerated electron beam sources.

3. Furthermore, in addition to teaching using the electron beams to ionize barium, Higuchi further teaches that yttrium is also ionized by the taught method (Claims 1 and 2 of Higuchi).

4. Furthermore, applicant's argument that the combination of DeLozanne and Higuchi would result in the substitution of a accelerated electron beam source of DeLozanne with the "unaccelerated" electron beam source of Higuchi is not persuasive. As has been discussed previously. Higuchi is provided to show that a metallic evaporation stream generated by resistive heating can be ionized by passing through an electron beam. Applicant's general assertion that Higuchi teaches an unaccelerated electron beam and DeLozanne teaches a accelerated electron beam and thus the two references are not compatible is not persuasive since neither reference clearly discloses whether or not the electron beams are accelerated or unaccelerated and based on the teaching of both references is appears that passing a vapor stream through an electron beam ionizes the stream regardless of whether or not the beam is accelerated or unaccelerated.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 5, 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeLozanne (U.S. Patent # 5,004,721) in view of Higuchi (U.S. Patent # 5,079,224) and Yanai et al (U.S. Patent # 4,511,594) (Suzuki et al (U.S. Patent # 4,622,919) is cited as evidence regarding electron beam apparatus.)

DeLozanne teaches an apparatus for forming oxide superconductor thin films comprising a vacuum container which comprises a first vacuum chamber 18 and a second vacuum chamber 12 (Column 2 Lines 33-34, Column 3 Lines 46-51 and Figure 1).

The apparatus further comprises a supporting base in the form of substrate 20 and a means for supporting the substrate in the form of substrate mount 21. As is taught by Figure 1 of the reference, both the substrate 20 and substrate mount 21 are inside the vacuum chamber 18, thus the reference teaches a vacuum container or chamber that houses the supporting base (Column 3 Lines 46-51 and Figure 1)

DeLozanne further teaches a resistance heating evaporation source in the form of restively-heated boat 14b which contains a second thin film material in the form of barium metal and as is taught by Figure 1 of the reference the resistance heating evaporation source 14b is

arranged within the vacuum container so as to face the substrate 20, which is the surface to be vapor-deposited (Column 4 Lines 1-3 and Figure 1).

DeLozanne further teaches a electron beam source 14a which is used for the electron beam evaporation of a first thin film material in the form of yttrium metal and as is taught by Figure 1 of the reference the source 14a is arranged in the vacuum container so as to face the substrate 20 (Column 4 Lines 1-3 and Figure 1).

DeLozanne does not explicitly teach an electron beam source to heat and evaporate the first thin material but this component would be a inherent feature of the taught electron beam source 14a as envisaged by Suzuki et al. Suzuki et al teaches a film forming apparatus comprising a vacuum chamber used to form a film by electron beam evaporation (Abstract and Column 2 Lines 15-18 of Suzuki et al). The electron beam evaporation component of Suzuki et al comprises a evaporator 6 which contains a deposition material A, which is analogous to the first thin film material of DeLozanne and a electron beam source or electron gun 6a which heats and evaporates the deposition material A (Column 3 Lines 1-4 and Figure 1 of Suzuki et al). Thus based on the teachings of Suzuki et al one of ordinary skill in the art would know that the electron beam evaporation source 14a of DeLozanne would inherently comprise an electron beam source to heat and evaporate the material contained in the source 14a.

Though DeLozanne as envisaged by Suzuki et al teaches all the structural components of the disclosed apparatus of claim 5 it does not teach the arrangement of the components where the path along which the electron beam travels intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor deposited as it travels to the electron evaporation source.

Higuchi teaches an apparatus for forming a superconductive thin film comprising barium yttrium, copper and oxygen (Column 3 Lines 13-18) which is the type of thin film being produced by the apparatus of DeLozanne. The apparatus of Higuchi comprises a resistance heating source containing barium (Column 3 Lines 19-36) which is the same resistance heated material of DeLozanne. Higuchi teaches that the barium metal material is heated and evaporated and the evaporated metal passes through an electron beam where it is ionized (Column 4 Lines 56-68). Higuchi teaches that by ionizing the metal to be deposited a film is formed with good crystallization and adhesion (Column 1 Lines 30-50).

Thus at the time the present invention was made it would have been obvious to arrange the electron beam source and the resistance heating evaporation source in a manner where the path along which the electron beam travels intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor deposited as it travels to the electron evaporation source. By arranging the electron beam source of source 14a of DeLozanne as envisaged by Suzuki et al in such a manner such that the electron beam intersects with a line segment connecting the resistance heating evaporation source 14b with substrate 20 the barium evaporated from the source 14b can ionized by the electron beam and thus produce a thin film which has good crystallization and adhesion as taught by Higuchi. Since it is known in the art that by ionizing barium with an electron beam prior to deposition produces a superior thin film one of ordinary skill in the art would be motivated to ionize the barium and this can be accomplished by using the electron beam source of DeLozanne as envisaged by Suzuki et al.

As for the limitation that the electron beam source and the electron beam evaporation source are arranged so as to be opposed to each other with respect to a straight line connecting

the resistance heating evaporation source with the surface to be vapor deposited, the electron beam source and the electron beam evaporation source would have to be opposed to each other with respect to straight line (i.e. on opposite sides of the straight line) since the only way for the resistance heated vapor stream traveling up through this straight line to intersect with the election beam is for the electron beam source and the electron beam evaporation source to be on opposite or opposing sides of this straight line.

As for the limitation that the electron beam source is capable of emitting an accelerated electron beam, neither DeLozanne nor Higuchi teach or suggest this limitation.

Yanai teaches an apparatus for depositing a metal or alloy film on a substrate using an electron beam gun in a vacuum chamber (Abstract and Figures 1 and 2). The electron gun or electron beam source used by the apparatus of Yanai is a self-accelerating or Pierce type electron gun, which emits an accelerated electron beam, and Yanai teaches that the advantage of this type of electron gun is that it is capable of vaporizing large quantities of film material (Column 2 Lines 3-9). Furthermore, Yanai teaches that the types of materials vaporized by the electron gun include those comprising copper and yttrium (Column 2 Lines 10-18), which are the two materials be vaporized by the electron beam sources of DeLozanne (Column 4 Lines 1-8 of DeLozanne).

At the time the present invention was made it would have been obvious to one having ordinary skill in the art to have an electron beam source capable of emitting an accelerated electron beam. Yanai teaches a known electron beam source in the art in the form of a self-accelerating electron gun, which emits an accelerated electron beam, and which is capable of vaporizing copper and yttrium comprising metals and alloys, thus one of ordinary skill in the art

would have a reasonable expectation of success in substituting the electron beam source of DeLozanne with the electron gun of Yanai.

Furthermore, applicant admits (Page 3 second paragraph of Arguments submitted on November 18, 2009) that DeLozanne inherently teaches a accelerated electron beam source.

As for claim 7, DeLozanne teaches that the apparatus comprises a glass nozzle 28 which sprays a reactive gas in the form of oxygen onto the substrate 20 (Column 3 Lines 56-63 and Figure 1) thus DeLozanne teaches that the nozzle 28 introduces a reactive gas in a portion on the surface to be vapor-deposited in which the thin film is to be formed.

As for claim 9, the specification of the present case defines "substantially on the same plane" when the electron beam can pass through the vapor stream of the second thin film material that is emanating from the resistance heating source (Page 5 Lines 10-15 of the specification of the present case). As was discussed in the claim 5 rejection, based on the teachings of DeLozanne as envisage by Suzuki et al in view of Higuchi the electron beam source and the resistance heating source are arranged so that the electron beam emanated from the electron beam source intersects a line segment connecting the resistance heating source with the surface to be vapor deposited thereby allowing the electron beam to pass through the vapor stream of the second thin film material thus ionizing it. For this reason it can be considered that the electron beam evaporation source, the electron beam source and the resistance heating evaporation source of the apparatus taught by DeLozanne as envisage by Suzuki et al in view of Higuchi are substantially on the same plane. Thus claim 9 is rejected.

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over DeLozanne in view of Higuchi and Yanai as applied to claim 5 above, and further in view of Suzuki et al.

The teachings of DeLozanne, Higuchi and Yanai as they apply to claim 5 have been discussed previously but neither of the references teaches that the apparatus comprises a bias device for applying a bias voltage to the surface to be vapor-deposited.

The apparatus of Suzuki et al comprising a bias device in the form of a bias voltage source 14 which is connected to, thus supplying bias voltage, a surface to be vapor deposited in the form of substrate T. Suzuki et al teaches that the bias voltage source 14 is present to accelerate the ionized vapor toward the substrate T for deposition. In other words the bias voltage supplied to substrate T attracts the ionized vapor to the surface of substrate T. (Column 4 Lines 9-16, Figure 2)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the present invention was made to add the bias device of Suzuki et al to the apparatus of DeLozanne in view of Higuchi and Yanai so that a bias voltage could be supplied to the deposition surface thus causing more attraction between the surface to be vapor deposited and the ionized thin film vapor materials.

Conclusion

Claims 5, 7 through 9 have been rejected. Claims 10 and 11 have been withdrawn from consideration as being a non-elected invention. No claims were allowed.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Wieczorek whose telephone number is (571)270-5341. The examiner can normally be reached on Monday through Friday; 7:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael Wieczorek/
Examiner, Art Unit 1792

/Michael Cleveland/

Supervisory Patent Examiner, Art Unit 1792